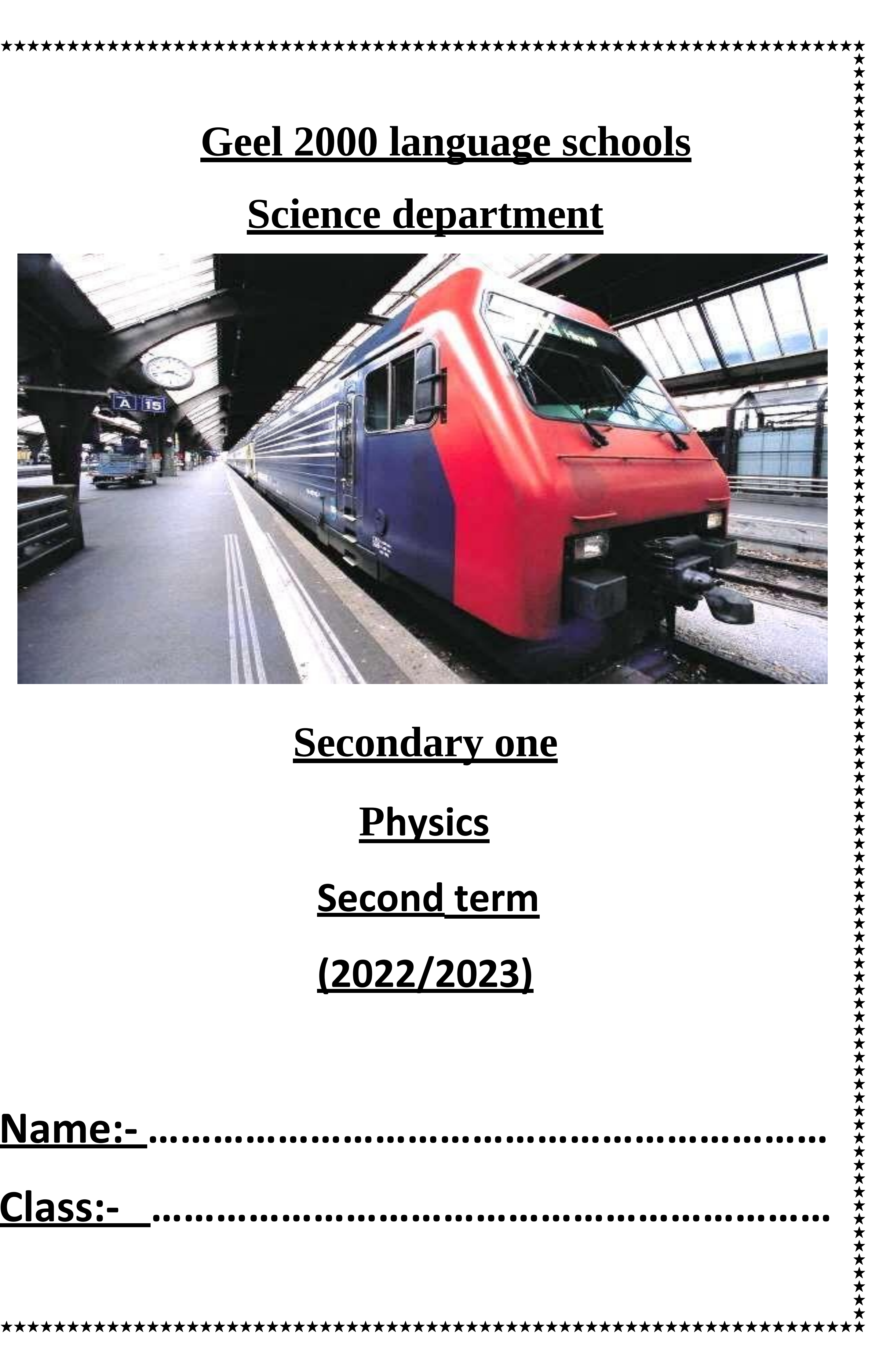


Geel 2000 language schools

Science department

Secondary one

Physics

Second term

(2022/2023)

Name:- ……………………………………………………………

Class:- ……………………………………………………………

Chapter One

Laws of circular motion

Uniform circular motion

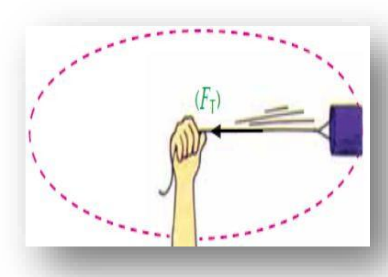
The motion of a body in a circular path at a constant speed and changeable direction.

Centripetal force

The force acting continuously in a direction normal to the motion of a body, changing its straight path into circular path.

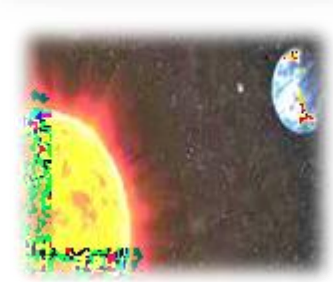
Types of circular motion:

1 - Tension Force (F_T)



A force acts as a centripetal force normal to the direction of motion of a body pulling a string or a wire, in a circular path.

2 - Gravitational Force (F_G)



A force originates due to the attraction force between large bodies and acts as centripetal attraction force normal to the direction of motion of the body .So, it moves in a circular path.

3 - Friction Force (F_f)



A force originates due to the resistance of a surface to the motion of a body on it .this force acts as centripetal force when it is normal to the direction of motion of the body.

4 - Reaction Force (F_N)



The centripetal force is the sum of the two components one of the reaction force and the other of the friction force toward the center of rotation.

5- Lifting Force (F_L)



The horizontal component of the lifting force on an airplane acts as a centripetal force.

Prove the centripetal Force

$$\frac{\Delta V}{\Delta L} = \frac{V}{r}$$

$$\Delta V = \frac{\Delta L\, V}{r}$$

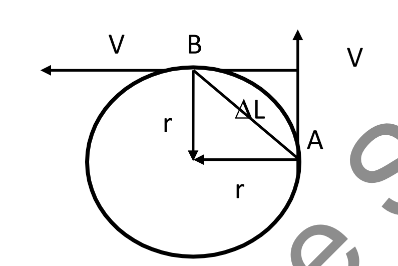
$$a_c = \frac{\Delta V}{\Delta t}$$

$$a_c = \frac{\Delta L\, V}{\Delta t\, r}$$

$$a_c = \frac{V^2}{r}$$

$$F_c = m \times a_c$$

$$F_c = m \times \frac{V^2}{r}$$



Centripetal acceleration

The acceleration by an object moving in a circular path due to a continuous change in the direction of its velocity.

Periodic time

The time taken to make one complete revolution.



Write scientific term:-

1- A force acts as a centripetal force normal to the direction of motion of a body pulling a string or a wire, in a circular path. (...............................)

2- A force originates due to the attraction force between large bodies and acts as centripetal attracting force normal to the direction of motion of the body .so, it moves in a circular path. (.................................)

3- A force originates due to the resistance of a surface to the motion of a body on it. This force acts as centripetal force when it is normal to the direction of motion of the body. (.................................)

4- The time taken by a body to make a complete revolution. (……………………..…..)

5- The force due to the resistance of a surface to the motion of a body. (………….………..)

6- The acceleration due to the change in the direction of body in circular motion. (.................................)

Choose the correct answer:

1- Two satellites (A) and (B) rotate around the earth, having the same periodic time. If the orbit radius of satellite (A) equals four times the orbit radius of satellite (B), the ratio between the velocity of satellite (A)to that of satellite (B) equals ………………

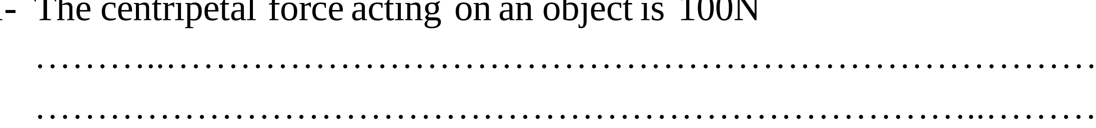
a- (2:1) b- (4:1) c- (1:4)

2- If the radius of a circular orbit is increased to four times its original value, the centripetal force required to make the speed of the body constant would be ………………

a- Decrease to half. b- decrease to quarter. c- increase to double.

What is meant by:-

1- The centripetal force acting on an object is 100N



………..……………………………………………………………………

…………………………………………………………………..………

2- The centripetal acceleration of an object is 40 m/s^2.

…………………………………………………..………………………

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When does…?

1- Force acting on an object makes its velocity increases without changing its direction.

………………………………………………………………………………

2- The linear acceleration of a moving object = zero.

………………………………………………………………………………

Write the mathematical formula and whate does the slope means:

F_c — V^2

a_c — V^2

Give reason for:

1- Although the body moving its acceleration is zero.

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2- When you leave an object moving in circular path it move in straight line.

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When each of the following happened:

1- F_c = a c (centripetal force equal to the centripetal acceleration).

………………………………………………………………………………

2- a_c = V^2 (centripetal acceleration and linear velocity)

………………………………………………………………………………

3- Acceleration is zero in circular motion.

………………………………………………………………………………

Problems:

1- A car in the amusement park of mass 200 kg moves in a circular path with velocity 10 m/s .If the centripetal force acting on it 2000N,**Find**:

a. The radius of rotation.

b. Centripetal acceleration.

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2- An object of mass 0.01 kg in a circular path of radius 150cm ,If it take 3s to make a complete revolution ,**Calculate** the magnitude and direction of centripetal force.

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3- An object of mass 2kg. moves around a circle of radius 2m. with velocity 12m/s, calculate.

a- Centripetal acceleration.
b- Centripetal force.
c- Linear acceleration.

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4- A car of mass 905kg. Moves in a circular path of 3.25km, calculate its tangential velocity if the force required to conserve its rotational motion equals 2140N.

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5- A car of mass 1000kg. Moves with uniform velocity 5m/s rotating around a curve of radius 50m. Calculate the central friction force to conserve its motion on the curve.

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6- An object of mass 2kg. Is held at the end of a rope and rotate in a horizontal circular path of radius 1.5m. so, that it makes 3 revolutions in one second, calculate:

a- The tangential velocity.
b- The centripetal acceleration.
c- The tension in the rope.

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Chapter Two

General gravitational law

The general gravitational law

A body in the universe attracts another body by a force which is directly proportional to the product of their masses, and inversely proportional to square the distance between them.

$$F = \frac{G\,M\,m}{r^2}$$

$G = 6.67 \times 10^{-11}\ N.m^2\ kg^{-2}$

Dimensions of (G) = $M^{-1}\ L^3\ T^{-2}$

The gravitational field

The space in which the gravitational forces appear.

The gravitational field intensity

The gravitational force acting on a mass 1kg.

$g = \frac{G\,M}{r^2}$ (r = R +h)

Satellites

The orbital velocity

The velocity that makes the satellite rotates around the earth in circular path at a constant distance from the earth's surface.

Orbital velocity

$F_c = F_g$

$$\frac{mV^2}{r} = \frac{GMm}{r^2}$$

$$V = \sqrt{\frac{G\,M}{r}} = m/s$$

Importance of satellite:

1- In communication.
2- Astronomical satellite.
3- Remote sensing satellite.
4- Spying satellite.



Choose:

1- The acceleration due to gravity ……………..

a- Is universal constant.

b- Change from point to another on the earth.

c- Changes according to the seasons.

d- Changing according to the distance between earth and sun.

2- The velocity required by a satellite to rotate around a planet depends on …….

a- Its mass only.

b- Mass of planet.

c- Mass of planet and the distance between them.

What happened in the following?

1- The satellite velocity = zero.

………………………………………………………………………………………

2- There is no gravitational force between earth and satellite.

………………………………………………………………………………………

3- The mass of one object decreases to its half and the distance between the two objects is doubled. (to the attraction force)

………………………………………………………………………………………

Problems:

1- If the mass of mercury planet is 3.3×10^{23}kg and its radius is 2.439×10^{6}m, calculate the weight of an object of mass 65kg on its surface. What is the weight of the same object on earth's surface ($G=6.67 \times 10^{-11} N.m^2/kg^2$, $g=9.8 m/s^2$)

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2- A satellite rotates in a circular path at height 300km from earth's surface, find:
a- Its orbital velocity.
b- Its periodic time.
c- Centripetal acceleration. (R=6400km, g9.8m/s^2)

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3- At what height from earth's surface, a satellite must rotate so that its periodic time around earth equal the time required by the earth to make a full revolution about its axis, if you know that (day on earth =24hour, M_e = 5.98x10^{24}kg , G= 6.67x10^{-11}Nm^2/kg^{-2})

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4- If the radius of planet is 7.14 x 10^7 m and its mass is 1.9 x 10^{27} kg and G= 6.67 x 10^{-11} N.m^2/kg^2, **Find**:

a. The attraction force acting on an object of mass 1 kg at the planet's surface.
b. The acceleration due to gravity on planet's surface.

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5- A satellite rotates at hight 800km from the earth's surface. Calculate:

a. Its orbital velocity.
b. Acceleration due to gravity at such hight.
(Re = 6363km, Me = 6x10^{24} Kg , G = 6.67x10^{-11} N.m^2/ Kg^2)

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Unit Four
Work & energy

Chapter one
Work & energy

Chapter two
Law of onservation of energy

Chapter One

Work and energy

Work

Force acting on object leads to move it a displacement.

Rule: W = F .d

Unit: joule = N.m. = Kg m^2/s^2.

Dimensional formula: $M L^2 T^{-2}$

Joule:

it is the work done by a force of one Newton to move an object through a displacement of one meter in the direction of the force.

Energy:

It is the ability (capacity) to do work.

P.O.C	Kinetic energy	Potential energy
Definition:	The energy possessed by the object due to its motion.	The energy possessed by the object due to its position or state.
M.R:	$K.E = \frac{1}{2} m v^2$	P.E = m g h
Factors:	1- Mass of object. 2- Velocity of object.	1- Mass of object. 2- Height above surface.
Unit:	Joule	Joule
Dimension:	ML^2T^{-2}	ML^2T^{-2}

Prove of K.E:

$V_f^2 - V_i^2 = 2 a d$

$V_f^2 = 2 a d$ $\qquad d = \frac{V_f^2}{2a}$

$F. d = \frac{F . V_f^2}{2a} = \frac{1}{2} x \frac{F}{a} x V_f^2$

$K.E = \frac{1}{2} m V^2$



Write the scientific term:

1- Work done by a force 1N to move an object through a displacement of 1m in the direction of the force. (....)
2- The Force done to move an object. (....)
3- The energy stored in the object due to its height. (....................................)
4- The energy during object's motion. (....................................)

Choose:

1- An object of kinetic energy 4J, if its velocity is doubled, its kinetic energy ……….
   a- 0.8J. b- 4J. c- 16J. d- 8J.
2- When the velocity of car is doubled, its kinetic energy……………
   a- Decrease to its half. c- is doubled.
   b- Increases 4 times. d- is inclined by an obtuse angle.
3- The energy stored in a spring is …………………..
   a- Kinetic energy. c- attraction energy.
   b- Potential energy. d- repulsion energy.

Give reason for:

1- Work is a scalar quantity.
……………………………………………………………………………
……………………………………………………………………………...
2- When a person moves horizontal while carrying bag he doesn't do a work.
……………………………………………………………………………
……………………………………………………………………………...
3- The potential energy of water at the top of water fall is higher than it at its bottom.
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……………………………………………………………………………
4- The kinetic energy of static object equals zero.
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Problems:

1- Calculate the work done to push a baby car a distance 3.5m by a force 20N.

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2- A force of 100 acts on an object and moves it a distance 2.5m. calculate the work by the force in the following cases:

a- The force is normal to the direction of motion.
b- Making angle of 60^o with the direction of motion.
c- The force with the direction of motion.

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3- Find the kinetic energy of a car of mass 2000kg. moves with velocity 60km/h.

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4- Find the mass of a body at the earth's surface if you know that its potential energy at a point that lies at a distance 5m. from earth's surface is 980J. ($g=9.8m/s^2$)

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5- A static object of mass 12 kg starts motion from rest with uniform acceleration 10 m/s^2 .**Calculate** its velocity and kinetic energy after covering a distance 80 m.

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6- An object of mass 1 kg is projected upwards with velocity 24.5 m/s until its velocity became 4.9 m/s ,**Calculate** its potential energy at that point . (g = 10 m/s^2)

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7-A lady pushes a baby car with constant force inclined on the vertical axis by an angle 30^o .The following table shows the relation between the work (W) and the distance (d):

W(J)	10	15	20	25	30	35
d(m)	2	3	4	5	6	7

a.**Draw** a graph relating (W) on y-axis and (d) on x-axis.
b.From the graph **Find** the force acting on the car.

Chapter Two

Law of conservation of energy

Law of conservation of energy

Energy neither created nor destroyed but transform from form to another.

Prove of conservation of energy:

$V_f^2 - V_i^2 = 2\,(-g)\,d$

$V_f^2 - V_i^2 = -\,2\,g\,(h_f - h_i)$

$V_f^2 - V_i^2 = -\,2\,g\,h_f + 2\,g\,h_i \quad (\times \frac{1}{2}m)$

$\frac{1}{2}mV_f^2 - \frac{1}{2}mV_i^2 = -\,m\,g\,h_f + m\,g\,h_i$

$\frac{1}{2}mV_f^2 + m\,g\,h_f = \frac{1}{2}mV_i^2 + m\,g\,h_i$

K.E + P.E = K.E + P.E

M.E = M.E

Mechanical energy

Sum of kinetic energy and potential energy.

Law conservation of mechanical energy

Sum of potential and kinetic energy along the path of the object is constant.



What is meant by:-

1 – Mechanical energy of an object is 100 J.

……………………………………………………………………………………
……………………………………………………………………………………

2 – The kinetic energy of an object is 40 J and its potential energy is 30 J.

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When are the following equals?

1 – The mechanical and kinetic energies of a free falling body.

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……………………………………………………………………………………

2 – The mechanical and potential energies for a body thrown vertically upwards.

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Drills:-

1 – A ball of mass 200 g falls from height 100m, **Calculate** the mechanical energy of the ball when it reaches half height. ($g = 10\ m/s^2$)

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2 – Calculate the work done by a worker to carry a sack of cement of mass 50 kg to a height of 20m If the sack falls from him to the ground, **Find** its velocity when it reaches the ground

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Final Revision

Question [1] Choose the correct answer :

1- An object of kinetic energy 25 j , If the velocity is doubled , its kinetic energy equals ……………

a) 2.5 j b) 100 j c) 50 j d) 25 j

2- The measuring unit of temperature is ……………

a) kelvin b) mole c) candela d) ampere

3- When a force acts on a moving body in an opposite direction of its motion , its speed ………………………

a) decreases without changing direction . b) increases without changing direction

c) doesn't change . d) changes and its direction changes also

4- If the magnitude of vector $\vec{X}$ = 6 and vector $\vec{Y}$ = 8 where the angle between them is 60° , the vector product = ……………

a) 7 b) 41.56 c) 24 d) 12.12

5- Newtons first law of motion can be expressed mathematically as …………

a) ΣF = Zero b) ΣF ≠ Zero c) F= ma d) F1 = -F2

6- If $\vec{A}$ and $\vec{B}$ are two vectors having an angle 120° between them where the magnitude of ($\vec{A}$) = 3 units and the magnitude of ($\vec{B}$) = 4 units, their cross product is …………

a) 12 b) -6 c) 10.39 d) zero

7- Two bodies of different materials having the same volume fall freely together from the same height , which statement describe correctly their arrival to the ground.

a) the heavier body reaches first b) the lighter body reaches first

c) the heavier body accelerates first d) they reach at the same time

8- An object of mass 4Kg and has a kinetic energy =50 J , its velocity = ………..

a) 100 b) 25 c) 12.5 d) 5

9-Two bodies of different materials having the same volume fall freely together from the same height. Which statement describes correctly their arrival to the ground?

a) the heavier body reaches first b) the lighter body reaches first

c) the heavier body accelerates more d) they reach the ground at the same time

10- If you are given two vectors $\vec{C}$ and $\vec{D}$ where $\vec{C}$ = 10 N , $\vec{D}$ = 18 N and the angle between them is 30^o , so their cross product = …………..

a) 155.88 n b) 90 n c) 103.92 n d) 180^o n

11- Work done is maximum when the direction of force makes an angle................... with the direction of displacement.

a) Zero b) 45^o c) 60^o d) 90^o

12- When the direction of acceleration is opposite to the direction of velocity , ………..

a)resultant force decreases b) object velocity increases

c) object velocity is unchanged d) object velocity decreases

Question[2] What is meant by :

1- A car moves at uniform acceleration = -5 m/s^2 .
2- Standard second .
3- Gravitation field intensity = 9.8 N/Kg
4- Saying that the displacement of a car to the north is 300m
5- The universal gravitational constant = 6.67 × 10-11 N.m2/kg2
6- Relative error

Question [3] : Write the scientific term :

1- The acceleration acquired by the body in a circular motion due to a change in the direction of its velocity .
2- The energy possessed by the object due to its position or state .
3- The motion which is characterized by having a starting point and end point .
4- The tendency of an object to keep either its state of rest or state of motion at its original velocity uniformly in a straight line .
5- The motion of a body in a circular path at a constant speed but changeable directions.
6- For every action, there is a reaction equal in magnitude and opposite in direction.
7- The mass of a cylinder made of platinum and iridium alloy of specific dimensions kept at $0°C$.
8- The work done by a force of one newton to move an object through a displacement of one meter in the direction of the force.
9- A type of motion which is characterized by having a starting point and end point.
10- It is the work done by a force of one Newton to move an object through a displacement of one meter in the direction of the force.
11- A physical quantity that cannot be defined in terms of other physical quantities.
12- A force acts as a centripetal force normal to the direction of motion of a body pulling a string or a wire in a circular path.

Question [4] : A) Give reason for :

1- When a person moves horizontally while carrying a bag , he doesn't do a wok .
2- Although the body moving in a circular path is affected by centripetal force , it doesn't go to the center of the circle .
3- The free fall acceleration may be either positive or negative.
4- Potential energy of water is greater at the top of water falls than that of the bottom.
5- The soldiers mount the back of the rifle into the shoulder cavity.
6- Mass is a scalar quantity.

Question [5] : A) Correct the underlined words :

1- **Distance** is the change of the position of an object .

2- The intensity of the Earth's gravitational field is determined by the relation g = **FM/r** .

3- The **direct** measurement needs more than one step .

4- **Time** is considered as a vector quantity .

6- If the force acting on a moving object is doubled while its mass is decreased to half ,the acceleration of its motion **decreases 2 times**.

7- Two vectors are considered equal if they have the same **magnitude only** even if they start from different points.

8- Dimensions of acceleration are **ML2T**.

9- **The planet atmosphere and the satellite volume** are factors that affect its orbital velocity around the earth.

10- **Speed** is the rate of change of displacement.

Question [6] When does each of the following:

1- Momentum of a body vanish.

2- The potential energy of a body and its weight equalize.

3- The force of attraction between two bodies is numerically equal to the universal gravitational constant.

4- Work done equals zero.

Question [7]: problems

1) A car driver applied the break when the car was moving at 20 m/sec to stop the car in a minute . **Calculate** :

1) The acceleration . 2) The distance moved till stopping

2) If y = (10 $\pm$ 0.2) cm and x = (5$\pm$ 0.1) cm

Find : 1) x + y 2) xy

3) A body of weight 300 N was moving at velocity 32 m/s . Its velocity becomes 50 m/s after 3 second . [Assuming that the free fall acceleration = 10 m/s^2]

Find : The force acting on that body .

4) An object is affected by a force 80 N to move it for a distance 5 m.

Calculate the work done

1- When the action of the force makes an angle (60°) to the direction of displacement.

2- When the force with the same direction of motion.

5) An object of mass 4.5kg $\pm$0.1 kg is moving at velocity 20m/s $\pm$1. **Calculate** the error in measuring its linear momentum. (Linear momentum = mass × velocity)

6) Find the mutual attraction force between sun and Jupiter giving that the mass of the sun 2.1×10^{30} kg , the mass of Jupiter 1.9×10^{27} kg , and the distance between their centers is 7.5×10^{11} m ($G = 6.67 \times 10^{-11}$ $N.m^2/kg^2$) .

7) An object is projected vertically upwards at initial velocity 60m/s , **Find** the time required to return back to the point of projection, then **Find the maximum height** reached. (given that free fall acceleration = $10 m/s^2$).

8) An object moves according to the relation (V_f) = $\sqrt{36 + 5d}$
Where (V) is velocity and (d) is displacement in meter.
Find : i- The initial velocity of the object.
ii- The acceleration of the motion.

9) A car of mass 1200 kg has accelerated from rest till its velocity becomes 8m/s after 4 seconds , Find the work done

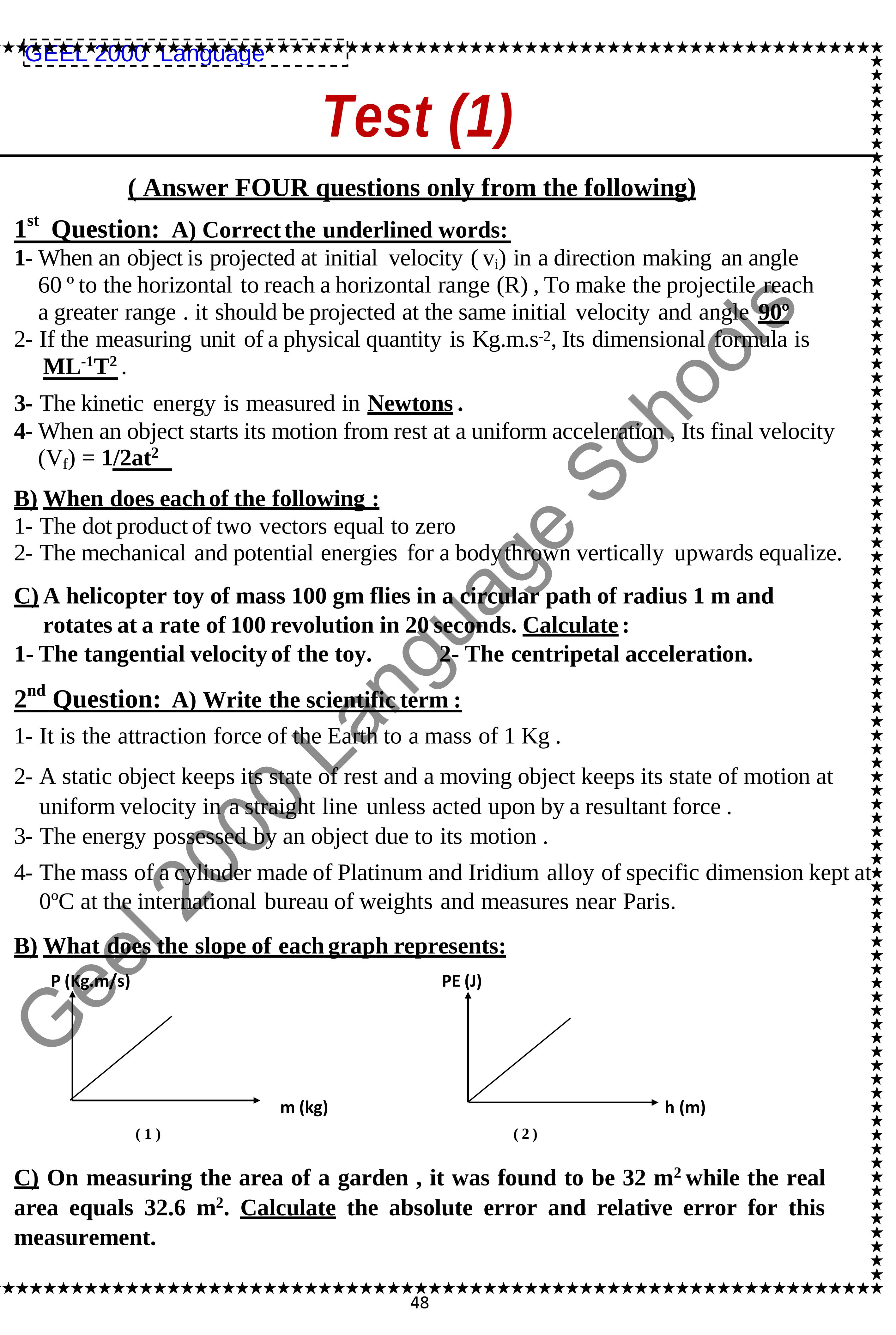
10) A bicycle rider moves in a circular path at a tangential velocity of 13.2 m/s. If the radius of the path is 40m and the force keeping the bicycle in a circular path equals 377N, **Calculate** the mass of both the bicycle and the rider.

11) A body of mass 2 kg is attached to the end of a string to rotate in a horizontal circular path of radius 1.5 m so as make 3 revolutions in one second .
Calculate : 1- Tangential linear velocity. 2- Centripetal acceleration.

12) An object of mass 5 kg falls freely from 10 m high above the ground , Find its kinetic energy when it becomes at 3m high above the ground .
[Given that free fall acceleration is 10 m/sec^2]

13) A person at the roof of a high building has projected a ball at velocity 50 m/sec. Given that the acceleration due to gravity is 10 m/sec^2 . **Find the velocity and the displacement** of the ball after 4 seconds in the following cases:
1- The ball has been projected vertically upwards.
2-The ball has been projected vertically downwards.

14) A force acts on a static object of mass 6kg placed on horizontal smooth plane accelerates it uniformly at $4 m/s^2$. **Find**
1- The magnitude of this force .
2-The time taken by the object to cover a distance of 32 m by effect of this force.



Test (1)

(Answer FOUR questions only from the following)

1^{st} Question: A) Correct the underlined words:

1- When an object is projected at initial velocity (v_i) in a direction making an angle 60^{o} to the horizontal to reach a horizontal range (R) , To make the projectile reach a greater range . it should be projected at the same initial velocity and angle **90^{o}**

2- If the measuring unit of a physical quantity is $Kg.m.s^{-2}$, Its dimensional formula is **$ML^{-1}T^{2}$**.

3- The kinetic energy is measured in **Newtons** **.**

4- When an object starts its motion from rest at a uniform acceleration , Its final velocity (V_f) = **$1/2at^2$**

B) When does each of the following :

1- The dot product of two vectors equal to zero

2- The mechanical and potential energies for a body thrown vertically upwards equalize.

C) A helicopter toy of mass 100 gm flies in a circular path of radius 1 m and rotates at a rate of 100 revolution in 20 seconds. Calculate :

1- The tangential velocity of the toy. 2- The centripetal acceleration.

2^{nd} Question: A) Write the scientific term :

1- It is the attraction force of the Earth to a mass of 1 Kg .

2- A static object keeps its state of rest and a moving object keeps its state of motion at uniform velocity in a straight line unless acted upon by a resultant force .

3- The energy possessed by an object due to its motion .

4- The mass of a cylinder made of Platinum and Iridium alloy of specific dimension kept at $0^{o}C$ at the international bureau of weights and measures near Paris.

B) What does the slope of each graph represents:

C) On measuring the area of a garden , it was found to be 32 m^2 while the real area equals 32.6 m^2. Calculate the absolute error and relative error for this measurement.

3rd Question: A) Choose the correct answer :

1- The mathematical relation for Newton's Second Law is ………….

a) $F = \Delta\ mv / \Delta t$ b) $F = m\ \Delta v^2 / t$ c) $F = v\ \Delta m^2 / t$ d) $F = m\Delta p / \Delta t$

2- Mechanical energy of an object equals ……………..

a) the product of its kinetic energy and potential energy.
b) the difference between its kinetic energy and potential energy.
c) the sum of its kinetic energy and potential energy.
d) No correct answer

3- If the distance between the centers of two bodies decreases to its half where their masses are kept unchanged , the attraction force between them would be …………..

a) quartered b) halved c) doubled d) increases four times

4- The unit of solid angle measure is ……………….

a) Radian b) Steradian c) Kelvin d) Joule

B) Proves that: $F_c = \frac{m \times v^2}{r}$

C An object is projected vertically upwards at initial velocity 60 m/s . Find the time required to return back to the point of projection and the maximum height reached given that the free fall acceleration = 10 m/s^2

4th Question: A) Compare between:

1- Scalar and Vector quantity (according to : definition – example)
2- Mass and weight (according to: definition – unit)

B) What are the factors that affect the orbital velocity of a satellite during its rotation around the Earth ?

C) An athlete of weight 850 N climbed a mountain . Find the work he did when he reached 150 m above the ground

5th Question: A) What is meant by:

1- The velocity of a car increases at a rate of 6 m/s every 1 S.
2- Displacement of a bicycle is 50 meters .

B) Give reason for:

1- The free fall acceleration may be positive or negative .
2- Time is a fundamental quantity

C) A driver saw the red traffic light when he was moving at 45 km/h at 100 m away from the car , He used the breaks to decelerate at 2m/s^2

1- Would the car cross the traffic sign ?
2- Calculate the time taken by the car to stop .

Test (2)

Answer four questions only

Question [1] : A) Choose the correct answer :

1- An object of kinetic energy 25 j , If the velocity is doubled , its kinetic energy equals ……………

a) 2.5 j b) 100 j c) 50 j d) 25 j

2- The measuring unit of temperature is ……………

a) kelvin b) mole c) candela d) ampere

3- When a force acts on a moving body in an opposite direction of its motion , its speed ……………………

a) decreases without changing direction b) increases without changing direction

c) doesn't change . d) changes and its direction changes also

4- If the magnitude of vector $\vec{X} = 6$ and vector $\vec{Y} = 8$ where the angle between them is 60° , the vector product = ……………

a) 7 b) 41.56 c) 24 d) 12.12

B) What is meant by :

1- A car moves at uniform acceleration = -5 m/s^2 .

2- Standard second .

C) Find the mutual attraction force between sun and Jupiter giving that the mass of the sun 2.1×10^{30} kg , the mass of Jupiter 1.9×10^{27} kg , and the distance between their centers is 7.5×10^{11} m ($G = 6.67 \times 10^{-11}$ $N.m^2/kg^2$) .

Question [2] : A) Write the scientific term :

1- The acceleration acquired by the body in a circular motion due to a change in the direction of its velocity .

2- The energy possessed by the object due to its position or state .

3- The motion which is characterized by having a starting point and end point .

4- The tendency of an object to keep either its state of rest or state of motion at its original velocity uniformly in a straight line .

B) Define :

1- Scalar quantity. 2- Newton's second law .

C) A car driver applied the break when the car was moving at 20 m/sec to stop the car in a minute . Calculate :

1) The acceleration . 2) The distance moved till stopping

Question [3] : A) Give reason for :

1- When a person moves horizontally while carrying a bag , he doesn't do a wok .

2- Although the body moving in a circular path is affected by centripetal force , it doesn't go to the center of the circle .

B) Write the dimensional formula of each of the following :

1- Acceleration 2- Speed

C) A body of weight 300 N was moving at velocity 32 m/s . Its velocity becomes 50 m/s after 3 second . [Assuming that the free fall acceleration = 10 m/s^2]

Find : The force acting on that body .

Question [4] : A) Correct the underlined words :

1- **Distance** is the change of the position of an object .

2- The intensity of the Earth's gravitational field is determined by the relation g = **FM/r**.

3- The **direct** measurement needs more than one step .

4- **Time** is considered as a vector quantity .

B) Proof that :

$d = V_i\ t + \frac{1}{2}\ a\ t^2$

C) An object is affected by a force 80 N to move it for a distance 5 m.

Calculate the work done

1- When the action of the force makes an angle (60°) to the direction of displacement.

2- When the force with the same direction of motion.

Question [5] : A) Compare between :

Mass and weight (Two points of comparison at least)

B) What are the types of centripetal forces ? (2 types at least)

C) The table below illustrates the relation between displacement of a car and time

d (m)	4	8	12	16	A	28
t (s)	1	2	3	4	6	7

i) Draw a graphical relation between (d) on the vertical axis and (t) on the horizontal axis .

ii) From the graph find :

1) The value of A .

2) The value of line slope .

3) The type of the car velocity .

Test (3)

Answer four questions only

Question [1] : A) Choose the correct answer :

1- The velocity of rotation required by the Earth to rotate around the sun depends on …………

a) mass of the Earth only
b) mass of the sun only
c) mass of the sun , Earth and distance between them
d) mass of the sun and distance between them

2- The dimensions of acceleration are ……………

a) LT
b) LT^{-1}
c) LT^{-2}
d) L^2T^{-1}

3- When two objects A = 5 Kg and B = 10 Kg are falling from the same height at the same moment , …………….. (Ignoring the air resistance)

a) they reach at the same time
b) B reach first to the ground
c) A reach first to the ground
d) A reach in half the time of B

4- If the distance between the centers of two identical balls is 0.5m and the force of attraction between them is 1.4×10^{-8} N, the mass of each one of them equals……($g=6.67\times10^{-11}$ $N.m^2.kg^{-2}$)

a) 14.6 Kg
b) 7.3 Kg
c) 53.29 Kg
d) 3.7 Kg

B) Proves that: $d = V_i t + \frac{1}{2} a t^2$

C) $\overrightarrow{A}$ and $\overrightarrow{B}$ are two vectors having an angle 30° between them where the magnitude of $(\overrightarrow{A})$ = 6 units and the magnitude of $(\overrightarrow{B})$ = 15 units . Find

1- The dot product
2- The cross product

Question [2] : A) Give reason for :

1- Mass is considered as a fundamental physical quantity.

2- When a man jumps from a boat to the reef , the boat shifts backwards.

B) Mention the importance of the following :

1- Satellite
2- hydrometer

C) When does each of the following equals zero ?

1- The work done on a moving object.

2- Acceleration of a moving object.

D) A racing car of mass 905 kg moves in a circular path of perimeter 3.25 km. Calculate the tangential velocity of the car if the force required to keep the circular motion of the car = 2140 N

Question [3] : A) Compare between:

1- Mass and weight **(two points of comparison)**

B) What is meant by :

1- Standard mass.(the kilogram)
2- The centripetal acceleration of an object is 28 m/s^2.

C) An object is projected vertically upwards to reach maximum height of 80 m, If g = (9.8 m/s^2) . Find :

1- Velocity of projection.

2- Time taken till the object returns back to the point of projection.

Question [4] : A) What happens in the following cases :

1- Increasing the orbital radius of a satellite to its double value (with respect to field intensity).

2- An object is affected by two equal forces in magnitude and opposite in their directions.

B) Correct the underlined words :

1- The kinetic energy of a car of mass (1500 kg) moving at speed (25 m/sec) is **37500 J** .

2- Factors that affect the momentum are mass and **weight**.

3- **Translational** motion is the motion that repeats itself over equal intervals of time.

4- **Relative error** is the difference between the real value and measured value.

C) A static object of mass 40 kg is affected by a force 60 N Find.

1- The acceleration acquired by the object.

2- The time taken by the object to move a distance of 300 m

Question [5] : A) Write the scientific learn :

1- The resultant force affecting an object equals to the time rate of the change in the object's momentum.

2- The sum of potential energy and kinetic energy of an object at any point on its path under the effect of gravity only is constant

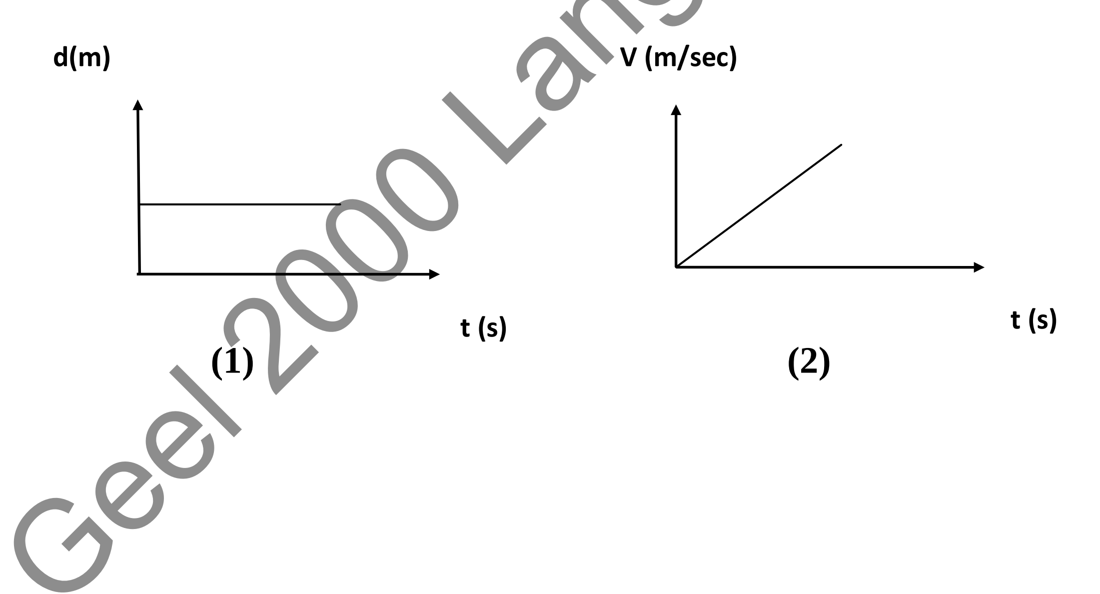
3- A physical quantity that can be fully defined by its magnitude only.

4- It is the force acting continuously in a direction normal to the motion of a body , changing its straight path into circular path.

B) Two boxes (A) and (B) have weights 50 N and 125 N respectively , the box (A) is on the ground while box (B) at 2 m high above the ground.

What is the height of box (A) in which it has the same potential energy as box (B).

C) Describe the kinematic state of the object and mention what the slope of the line equals in each graph:



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Test (4)

Question [1] :

A) Choose the correct answer :

1- Two bodies of different materials, fall freely to ground if the mass of the 1st object is twice the mass of the second object, the ratio a_1/a_2 = ……..…… .

a) $^1/_2$ b) 1/1 c) 2/1

2- An object moves along the circumference of a circle of radius (r) , its displacement when it moves one and half revolution is …………... .

a) $^1/_2$ r b) r c) 2r

3- A car took 3 seconds to have a velocity ten times its initial velocity , the acceleration of its motion is numerically equal to ………..…..its initial velocity.

a) ten times b) three times c) double

4- An object is moving at a constant velocity 8 m/sec for 8 sec, Its acceleration equals ……..

a) 8 m/sec^2 b) 1 m/sec^2 c) zero

B) When does each of the following values equal zero ?

1- The difference between two vectors .

2- The horizontal component of the initial velocity of a projectile.

C) Two perpendicular forces F_x and F_y act on an object where $F_x = F_y = 80$ N , Find

I - The resultant of the two forces F_x and F_y

ii- The angle between their resultant and X-axis .

iii- Does the object move or remain constant ?

Question [2] :

A) Give reason for:

1- Force is a vector quantity.

2- The acceleration of gravity varies slightly from a place to another on Earth.

B) Proves that : $d = V_i\, t + \frac{1}{2} a t^2$

C) Write the mathematical formula and what does the slope means :

1) Fundamental physical quantity.

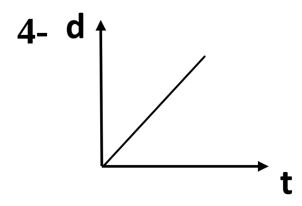
2) Distance

1- a / d

2- a / $^{1}/_{d}$

3- a / $^{1}/_{t}$

4-



D) An object is projected vertically upwards in a straight line and returned back to the point of projection after 4 sec. (g = 9.8 m/sec^2). Find :

i- The velocity of projection.

ii-Total distance covered .